

Safer Passage in the Flying Canoes

A privately sponsored aircraft crashworthiness program leads a sampling of spinoffs in the field of public safety

Noba, a teenager of eastern Peru's Culina tribe, was critically wounded by gunshot on a wild pig hunt deep in the jungle. Prompt action by Jungle Aviation and Radio Service (JAARS) saved his life; the boy was airlifted to a medical outpost for emergency treatment, thence over the Cordillera Andes to Lima for surgery.

Half a world away in the rugged mountains of the northern Philippines, Jojo Soberano fell into a deep ravine, injured her back and lay helpless for five days. An extensive search by a JAARS helicopter located her; Jojo was taken by the helicopter to a nearby village, then by another JAARS plane to a hospital in Manila.

These are examples of the type of work JAARS pilots do in their "flying canoes." That's what one Colombian tribe calls the JAARS aircraft, because they reach places in the roadless jungle otherwise accessible only by boat. JAARS pilots are frequently called upon for rescue jobs because often their planes are the only transportation in the area. But JAARS' regular work is transporting missionaries to remote corners of the world. Headquartered in Waxhaw, North Carolina, JAARS is a department of Wycliffe Bible Translators, a private missionary organization whose members live with the peoples of Third World lands, learn their languages and translate the Bible into those languages. The Service operates a fleet of assorted aircraft ranging from single-engine lightplanes to a DC-3 transport. It is part bush airline



Jungle Aviation and Radio Service (JAARS) delivers missionaries to remote outposts under sometimes hazardous flying conditions, exemplified by these photos; above, a landing at a tiny airstrip hacked out of the Philippine jungle, at left, a helicopter touchdown on a promontory, typical of operations in New Guinea and Indonesia. A serious accident led to JAARS' initiation of a crash survivability research program that is based on NASA technology.

and part communications link, maintaining daily contact with the missionaries living in remote tribal villages and otherwise cut off from the outside world.

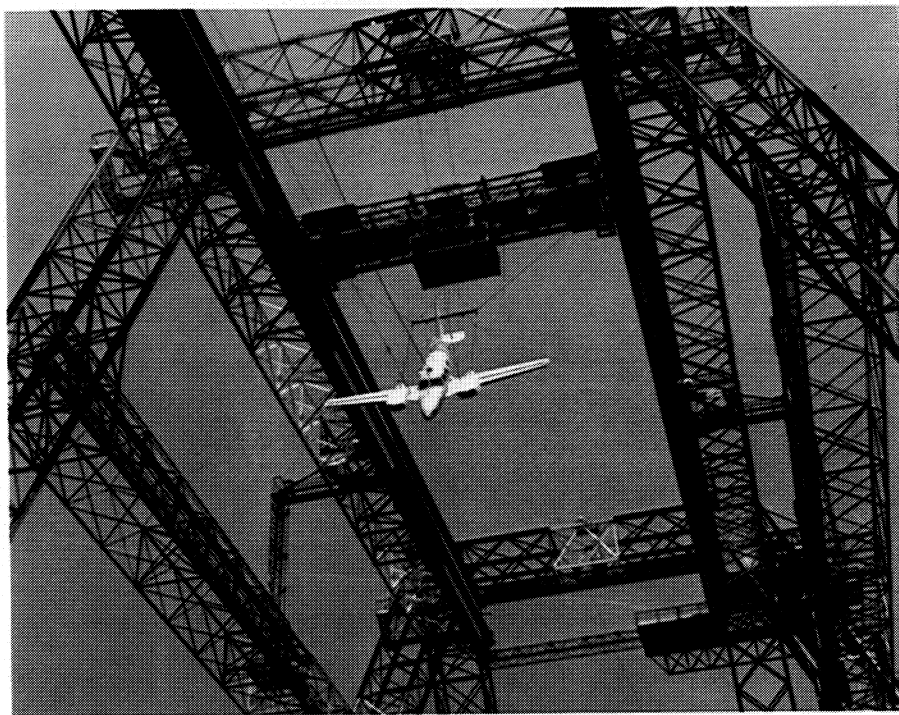
Remote is the key word. Most of the places where Bible translations do not yet exist are really remote, some of them all but inaccessible. Getting to them means flying over jungle and mountain areas that offer few emergency landing sites, or operating into airstrips not much longer than driveways, or slithering to a landing in slippery muck after a rain forest deluge, or setting a floatplane down on uncleared waterways where a submerged log may rip it apart. It is definitely not routine flying and there is the ever present chance of accident. That's why JAARS is engaged in its own technology development program designed to increase plane occupants' chances of survival in the event of a crash.

JAARS' safety record is surprisingly good: only one fatal accident in its 35-year history. There have, however, been a number of accidents, some of them causing serious injury. JAARS' goal, like that of all flying organizations, is zero accidents, but the Service is realistically preparing for future crashes. With NASA assistance, JAARS and another missionary group—Mission Aviation Fellowship—are conducting a privately-funded Joint Mission Aviation Crashworthiness Committee Crash Protection Program. The program focuses on survivability on the types of aircraft used in missionary activities; about 30 missionary organizations operate some 500 aircraft of the general aviation variety—lightplanes, light transports and helicopters—in virtually every Third World country.

The NASA connection dates to 1978, when JAARS sought help from Langley Research Center and was invited to participate in Langley's crashworthiness research, a comprehensive program that includes deliberate crashing of surplus aircraft, study of the forces involved, and development of technology to increase passenger survivability by minimizing the effect of crash forces. JAARS people visited Langley on a number of occasions, witnessed crashworthiness tests, attended flight safety conferences, studied NASA

reports on crash dynamics, and filled in their knowledge gaps through frequent interviews with their Langley mentor, research operations supervisor Dwight McSmith, who has since retired.

By 1981, JAARS had acquired sufficient crash dynamics expertise to embark on its own technology development program. For its initial project, JAARS decided to develop a seat for general aviation aircraft that absorbs much of the energy of a crash impact so that the forces acting upon the seat's occupant are substantially reduced. The Service came up with an innovative design—based on NASA technology—that was twice tested at Langley in controlled crashes with an instrumented dummy strapped in



the seat. These tests dictated certain modifications, which JAARS made.

Last year the seat passed its final hurdle with successful tests at the Federal Aviation Administration's Civil Aeromedical Institute, Oklahoma City, Oklahoma. Now JAARS is installing the safety seats in all its aircraft at its Waxhaw maintenance facility. The seat design is available to all missionary aircraft and JAARS is offering it for commercial manufacture. The next step contemplated is design of a new missionary aircraft incorporating not only the seats but a number of other advanced safety technologies.

With technical assistance from Langley Research Center, JAARS developed an impact-absorbing aircraft seat designed to minimize crash injury. Occupied by an instrumented dummy, the seat was tested in a controlled crash of a full-size aircraft dropped from this structure at Langley (above).

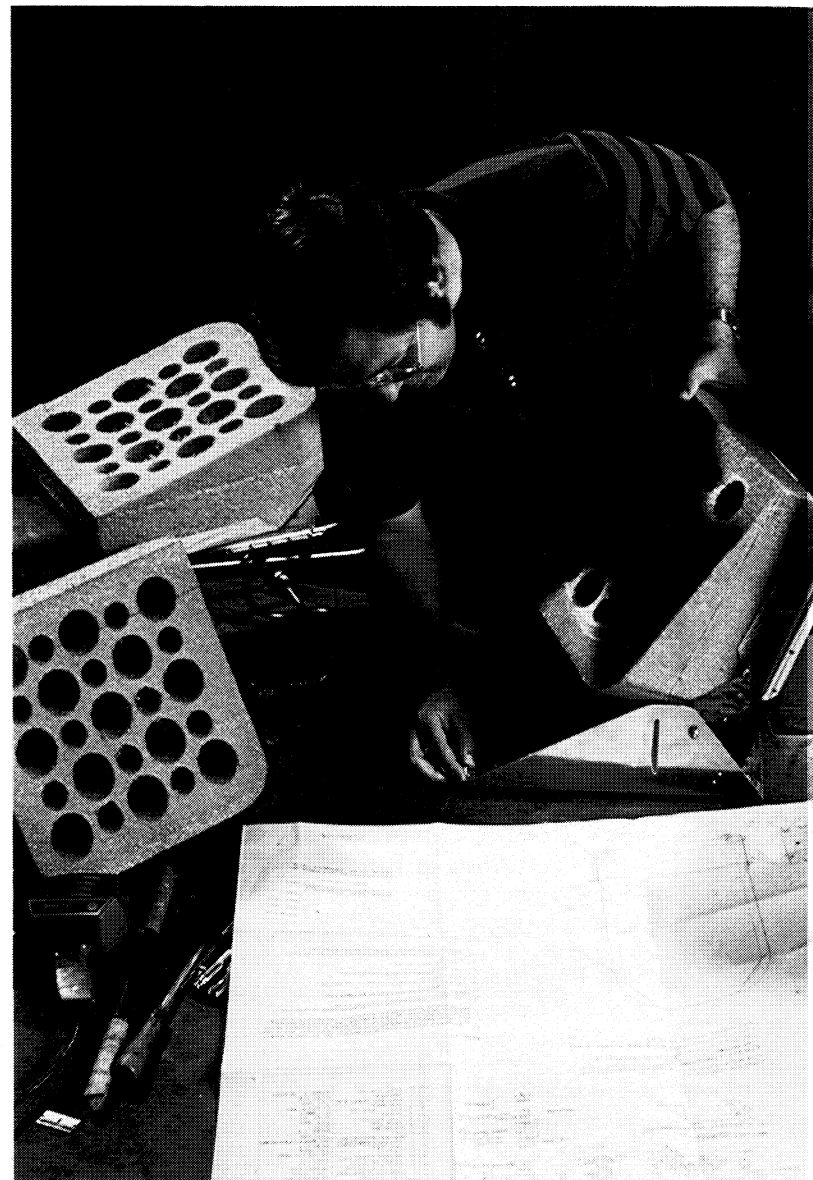


With mechanic Terry Hefffield (standing), Paul Duffey looks over a blueprint for modification of the airplane in the background. Duffey is director of aviation for Jungle Aviation and Radio Service (JAARS), which is conducting a program to increase occupant survivability by modifying its aircraft. The program grew out of Duffey's crash landing in the jungle of Ecuador, which left him confined to a wheelchair.



At its Waxhaw, North Carolina maintenance facility, JAARS is modifying each of the aircraft in its fleet to incorporate an innovative safety seat, designed by the Service with NASA research and testing help. In the above photo, a technician is working on a key feature of the JAARS seat: the "S-frame," in which S-shaped front legs absorb much of a crash impact so that substantially less force is transmitted to the occupant.

Additional crash protection is provided by installing a special type of impact absorbing foam block over a solid metal seat pan. The holes drilled in the foam block are another way of reducing crash impact.





Shown above are JAARS safety seats with and without the foam pad and fabric covering.

Next to last step in the modification process is installation of a seat track in such a manner that the track becomes an integral part of the airplane, further improving passenger protection. In the photo below, mechanic Terry Hefffield models the completed seat installation.

